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I.

ANNUAL ADDRESS.

BY CHIEF-JUSTICE DALY, THE PRESIDENT.

SUBJECT — THE GEOGRAPHICAL WORK OF THE WORLD IN 1872.

DELIVERED FEBRUARY 17TH, 1873.

PHYSICAL EVENTS OF THE YEAR.

The physical events of a geographical and general character which have especially marked the past year have been: The wide-spread disturbance of the earth's crust, as exhibited in volcanic action and earthquakes, atmospheric disturbances in the shape of storms, cyclones, hurricanes, and tornadoes, distinguished by their wide distribution over the earth's surface, their intensity, the frequency of their occurrence, and the great destruction of life and property that has attended them; enormous rainfalls, especially in Asia, and extensive inundations and devastating floods, from the overflow of rivers, and the action of the sea upon coasts in Europe; remarkable extremes of heat and cold in various parts of the globe, exceptional in their intensity, and the length of their duration, with all of which, perhaps, should be connected observations made during the year of additional evidences of the gradual rising and sinking of the land in different parts of the earth, as indicated by marks upon the coast-line of continents and islands.

Among the most prominent of these physical events, I may name the earthquake in California in March last, which extended over 1,500 miles of territory, and during the three days of the continuance of which it is said seven thousand shocks were felt. The earthquake in the unfortunate city of Antioch, in Syria, involving the loss of two thousand lives; the occurrence, ten days after, of violent shocks at Accra, on the Gold Coast of Africa, contemporaneous with which was the great hurricane that destroyed every vessel but one in the harbor of Zanzibar; and earthquakes, more or less severe in their effects, in New Zealand, in Java, in the Philippine Isles, at Shemacha in the Caucasus, in England, Scotland, and other places in Europe, at Valparaiso, Hawaii in the Sandwich Islands, Oaxaca in Mexico, in Tennessee, Iowa, Dakota, on the North-east coast of America, over the New England States, and as far north as Quebec; and submerged earthquakes upon our Western lakes.

The continuous passage, from February to May last, of immense ice fields along the coast of Newfoundland, from Baffin's Bay and Smith's Sound; the eruption at Mount Vesuvius, last April, the most terrible known for centuries; the great February storm in the North-west of the United States, during which eight hundred railroad cars were blocked and numerous lives lost; the remarkable snow drifts in Nova Scotia, thirty feet high; the tornado in Ohio, blowing down one hundred and sixty houses; and the great gales involving an extensive loss of property on our Western lakes; the immense rainfall in Bombay; the violent cyclone in the harbor of Madras; the terrific gales and hurricanes on the Baltic and North Sea, by which one thousand miles of land were flooded, the water rising higher than had ever before been known; the inundation of the River Po, covering four hundred square miles and rendering sixty thousand persons homeless; the inundations of the Rhine, the Seine, and the Loire, and toward the close of the year, the ten days' storm, hurricane, and floods in England, and the extraordinary whirlwind in Ireland; the intense cold in the beginning of the year, by which many persons in our Northwestern States perished; the excessive heat during the months of May, June, July, and August; the phenomena of extraordinary electrical convulsions throughout the United States, during this heated period, and the appearance of huge sun-spots, which were discovered and seen for many days toward the close of July; the excessive cold of the present winter, one of the accompaniments of which has been the terrific snow-storm that recently overspread the State of Minnesota, during which hundreds of persons exposed to it, and unable to escape, were frozen to death; to which enumeration, by no means a full one, I may add the terrible earthquake which occurred a few weeks ago at Somghee, in India, a town 114 miles north of Bombay, involving the loss of 1,500 lives.

The occurrence of physical events of this character, so wide-spread and so numerous, within the limited period of a single year, adds weight to the theory maintained by Lyell and other geologists, that causes now in operation, and which may have been acting over long periods of time, are adequate to account for all the disturbance and changes that have taken place upon the earth's surface.

AMERICAN EXPLORATIONS AND SURVEYS.

In the general survey of the geographical work accomplished during the past year, I will first call attention to what has been done in our own country. It comprises the various labors of the Coast Survey, under the admirable superintendence of Prof. Peirce; of the Engineer Corps of the U. S. Army, under the direction of its accomplished chief, Brig.-Gen. A. A. Humphreys, whose report for the year is one of unusual extent and exceeding interest; the explorations in the Territories of Utah, Idaho, and Montana, under the direction of Prof. F. V. Hayden, the chief of the Geological Survey of the United

States Territories; the continuation of the survey of the fortieth parallel, under Mr. Clarence King; the explorations west of the hundredth meridian, under Lieutenant George M. Wheeler, of the Engineer Corps; a reconnoissance of the basin of the Upper Yellowstone River, in Wyoming and Montana Territories, embracing the head-waters and sources of that river, by Capt. J. W. Barlow, assisted by Capt. D. P. Heap, of the Corps of U. S. Engineers; explorations and surveys in the Uintah Mountains in Utah, by Capt. W. A. Jones, of the same corps; the determination of the difference of longitude between Detroit, Mich., and Fort Leavenworth in Kansas, by Lieut. E. H. Ruffner, likewise of the same corps; and the reconnoissance and cartographical labors, under the direction of that officer, for a series of maps on the scale of an inch to four miles, embracing Kansas, west of the sixth principal meridian, Colorado as surveyed, the Indian Territory, Chickasaw Nation, and a part of New Mexico; the continuation of Prof. Powell's exploration of the Colorado River and its vicinity, and the exploration by his associate, Prof. Thompson, of the region north toward the Wahsatch Mountains; the exploration and scientific investigation, by W. H. Dall, Esq., upon the geography, hydrography, and natural productions of the Aleutian Islands, and their vicinity; the surveys, explorations, and reconnoissances in connection with the building of the North Pacific Railroad from the head of Lake Superior to Puget Sound, under the Chief Engineer, Gen. W. Milnor Roberts; the meteorological observations of the Signal Service Bureau of the War Department, under Brig.-Gen. A. J. Myer; the completion of the scientific voyage of the "Hassler" around the Continent of South America, organized by the Coast Survey for the more particular observation of the coast lines of South America, for deep-sea dredging throughout the voyage, and the making of Zoölogical and other collections in natural history, to which should be added the continuation of the geological surveys of the States of New Hampshire, New Jersey, Ohio, Michigan, Indiana, Illinois, Louisiana, and California, embracing an amount of work, which, in extent and value, will compare with that of any previous year.

Before proceeding to give a brief account of the nature of these respective labors, I must express my acknowledgments, particularly to Prof. Hayden, Lieut. Wheeler, Gen. W. Milnor-Roberts and E. R. Esterbrook, Esq., of the Signal Service, all of whom have most kindly, upon request, furnished me with the latest information in their respective departments.

COAST SURVEY.

The year was unfavorable for surveying operations along our coast; but the labors of the Coast Survey have been in other respects active and important. They have embraced the scientific voyage of the steamer "Hassler" around the Continent of South America, which was organized for the more particular observation of the coast-lines of that continent, for deep-sea dredging throughout the course of the voyage, and for the making of zoölogical and other collections in natural history. The temporary occupation of points upon the Rocky Mountains for scientific purposes; an expedition for the more exact determination of the difference of longitude between Washington and Greenwich, which, under the direction of Prof. J. E. Hilgard, was brought to a successful conclusion last September; the continuation of the survey of the harbor of New York, in which considerable progress was made during the year, and observations relating to the hydrography of the Gulf of Mexico.

VOYAGE OF THE "HASSLER."

The voyage of the "Hassler" lasted nine months. The chief scientific result has been the observation by Prof. Agassiz of the evidence of post-glacial action on the coast of South America, both on the Atlantic and the Pacific side, below the thirty-seventh parallel of south latitude, with the detection of existing glaciers in the Straits of Magellan and on the coast of Chili, and an immense zoölogical collection, embracing 100,000 specimens, the fish in which alone amount to 30,000. The deep-sea dredging, a very important object, was not pursued to any extent, from some defect in the apparatus or other cause.

Agassiz found a strong resemblance between many parts visited and regions of the Alps with which he is familiar, which resemblance, he says, is not superficial, but extends to the geological structure of the whole region. What he saw, he says, was the evidence of glacial action, or, as he expresses it, terrestrial masses of ice moving upon the solid ground, and not icebergs, which as floating bodies could not have produced the abrasion which he saw; the planing, grooving, and furrowing of the rocks. He found the country presenting a glacial-worn aspect as far north as the Gulf of Peñas, in Chili. His conclusion from what he saw was that during the glacial period both hemispheres must have each been capped with an enormous sheet of ice, one moving northwardly from the Atlantic, and the other southwardly from the Arctic toward the equator. He says, from what he saw in South America, he is convinced that ice has been the great paring machine by which the rocky surfaces of the globe have been fashioned, and that the great geological agents have not alone been fire and water, but that ice has had a great share in moulding the earth's surface. The professor says that he knows that his observations will be questioned, and adds, pleasantly: "An old hunter does not take the track of a fox for that of a wolf; and I, an old hunter of glacial tracks, know their foot-prints when I find them." I should perhaps here mention that Prof. Hartt, who accompanied Agassiz in the exploration of the Amazon, in a paper read before this Society during the year, pointed out mistakes which the professor had made in the observation in South America of what he supposed to be the result of glacial action ; and that eminent geologists, such as Lyell, Dawson, Dr. Sterry Hunt, and Home, do not admit that there ever was such a glacial period as Agassiz believes to have existed, or anything at any time but glaciers in particular localities; and the opinion of these geologists has been somewhat strengthened by recent observations of M. C. Grad in North Africa, especially in the Atlas range and in the Desert of Sahara. On the other hand, Lieut.-Col. Drayson, R. A., has just published a work in which he gives not only a formidable array of evidence in proof of a glacial epoch, but assumes it to be a necessary consequence of the change which takes place in the direction of the earth's axis, whereby the whole earth is affected. This change, Col. Drayson argues, would, in about 16,000 years, cause a decrease in the obliquity of thirty-five degrees, which, he says, would bring about climatic changes quite sufficient to produce Agassiz's glacial epoch.

SURVEYS AND EXPLORATION OF THE UNITED STATES ENGINEER CORPS.

The labors of the Engineer Corps during the past year have been very extensive in the geographical work of the improvement of harbors and rivers, a matter of the highest importance and value in our country, so large a portion of which is as yet but partially developed. The survey of our great lakes by the corps has also been carried on; that of Lake Superior being completed, and that of Lake Michigan carried so far that it will probably be completed in another season. With this work have also been connected astronomical and meteorological observations, and lake-surface observations, extending over the entire lake region.

PROF. HAYDEN'S EXPLORATION IN UTAH, IDAHO, AND MONTANA TERRITORIES.

The result of Prof. Hayden's expedition during the year in Utah, Idaho, and Montana, I prefer to give in the language of the communication he has courteously sent me:

"The report of the exploration of the valley of the Upper Yellowstone, and the head-waters of the Madison, during the season of 1871, by the U. S. Geological Survey of the Territories, created such an interest in the public mind all over the country that Congress was led thereby to pass a law forever withdrawing from the public lands intended for sale, or occupancy by settlers, a tract comprising 3,575 square miles. This reservation was called the Yellowstone National Park, and was intended to preserve and protect the wonderful curiosities of nature within its borders for the benefit and instruction of the people. To complete this exploration, so successfully commenced, a second expedition was made into that region during the past summer (1872). The appropriation for the survey by Congress, during the session of 1871–72, was so liberal that the geologist in charge was enabled to organize two separate parties. To each of these parties there were attached a geologist, an astronomer, topographer, and meteorologist, with the necessary assistants for each. One of the parties, under the immediate direction of Mr. James Stevenson, surveyed a route from Ogden, Utah, to Fort Hall, Idaho Territory, where full preparations were made for a pack-train with supplies to proceed up Snake River. The party passed up the west side of Snake River valley, making a careful, detailed survey of all the branches of that stream, located the Great Teton range, and then passed up the valley of Henry's Fork, and entered the Madison Valley through the Targee Pass, and reached the Geyser Basin, August 14.

"The second party, under the direction of Prof. Hayden, proceeded to Bozeman, Montana, in the valley of the Gallatin, and made that its point of departure. The valleys of the Yellowstone, Madison, and Gallatin, with their numerous branches, were all carefully examined, and the materials secured for a map of the country in contour lines of one hundred feet each.

"The event of the season was the ascent of the Grand Teton. There is no tradition that any white man has ever reached its summit. A party of thirteen began the ascent; but only two succeeded, Mr. Stevenson and Mr. Langford. They found upon the summit a rude structure, which appeared to be an inclosure, and which must have been built several hundred years since, and is supposed to have been used as a protection from the wind.

"The elevation of the Grand Teton was found to be 13,762 feet above the sea, thus making it one of the monarch peaks of our continent.

"The examination of the four remarkable passes at the head of Henry's Fork was another of the interesting and important results of this Survey. Here are four passes across the water-shed of the continent, connecting the Atlantic with the Pacific Slope. These passes represent the four points of the compass. The Targee, or East Pass, is 7,063 feet above the sea, and opens into the Upper Madison, forming the most important gateway to the Yellowstone National Park. The Madison, or North Pass, leads into the Lower Madison Basin, thus connecting the North-west with the great interior basin of Utah, as well as the Pacific Slope. The Red Rock Pass, with an elevation of 7,271 feet, leads to the valley of Jefferson Fork, and thus to any portion of Montana. Henry's Lake, which gives origin to Henry's Fork, is located in the centre of these passes, and has an elevation of 6,443 feet.

"This wonderful region, which seems to form the apex of the continent, was carefully explored and mapped. Here, within a radius of fifty miles, the snows that fall upon the mountain-tops give origin to the largest rivers on our continent, forming one of the most remarkable water-sheds, in a geographical point of view, in the world. On the north side are the sources of the Yellowstone ; on the west, those of the Three Forks of the Missouri; on the south-west and south, those of the Snake River, flowing into the Columbia, and thence into the Pacific; and those of the Green River, flowing southward to join the Great Colorado, and finally emptying into the Gulf of California; while on the east side are the numerous sources of Wind River. We thus see that this water-shed gives origin to three of the largest rivers in North America—the Missouri, Columbia, and Colorado. The general elevation of this portion is from 7,000 to 8,000 feet; while the mountain-peaks, which are very numerous, average from 9,500 to 11,000 feet. From one lofty peak at the source of Snake River 470 mountain-peaks were counted within the circle of vision.

"About the sources of Snake River it was found that the existing maps were quite incorrect. Madison Lake, which was previously supposed to be the source of Madison River, was found to give origin to Snake River. It is a beautiful body of water, about eight miles wide and twelve miles long. From it flows a stream about one hundred feet wide, which, after flowing a distance of five miles, empties into another lake, about four miles long and one and a half miles wide. The first of these was called Lake Shoshonee, and the latter Lake Lewis, in honor of the great explorer of the North-west.

"At the upper end of Lake Shoshonee a new geyser basin was discovered, containing over one hundred springs, several of which ranked with first-class geysers. The ornamentation about these springs is peculiar, and even more beautiful than that around the springs in the geyser basins on the Madison.

"Careful observations were made by both parties for latitude and longitude at every available point, and several localities, as Fort Hall, Virginia City, Fort Ellis, and Helena, were fixed with a good degree of precision.

"Six of Green's best cistern barometers, and a dozen aneroids, were in constant use. The observations and collections in geology, mineralogy, botany, and the various departments of natural history, far exceeded those of any previous year.

"Besides the two principal parties mentioned above, five small parties have been operating in different parts of the West, under the auspices of the Survey, with great success. Prof. Joseph Leidy spent about two months examining the ancient lake basins of Wyoming for vertebrate remains, and Prof. E. D. Cope occupied most of the season in various parts of the West, making most important discoveries.

"The relations of the great Cretaceous and Tertiary groups of the West to each other have become a question of the highest interest; and Mr. F. B. Meek, the distinguished paleontologist, spent the summer along the line of the Pacific Railroad, studying these formations and collecting the evidence from invertebrate fossils; while Prof. Leo Lesquereux, our great authority on fossil botany, took up the coal groups in the West, and made the plants a subject of special investigation; and Prof. Cyrus Thomas devoted the summer to the agricultural resources of the North-west.

"All these gentlemen are now busily engaged in preparing their reports for publication by Congress."

SURVEY OF THE FORTIETH PARALLEL.

The geological and topographical exploration of the territory between the Sierra Nevada and the Rocky Mountains, under Mr. Clarence King, has, during the year, embraced the completion of the field-work of the geological exploration of the fortieth parallel; an illustrative series of the studies of the geology and topograpy of the extinct volcanoes, and further studies in glacial action. A third volume of this most interesting survey is now in the course of publication by the Government.

LIEUT. WHEELER'S EXPEDITION IN NEVADA, UTAH, AND ARIZONA.

From notes kindly furnished me by Lieut. Wheeler, I am enabled to give the result of the year's work of the expedition under his charge. There have been three seasons of field-work in 1869, 1871, and 1872; the areas embraced being Eastern California, nearly the entire part of Nevada south of the fortieth parallel, Western and Southern Utah, and Northern and Western Arizona. Some idea of the vastness of this field of exploration may be inferred from the fact that these surveys covered a belt of country equal in area to the whole of the New England and the Middle States, and that the reconnoissance lines of these surveys reach, at the least, fifteen thousand miles. They have been made in conformity with an act of Congress, the object of which is to establish an astronomical base, and the continuance of military and geographical surveys and explorations West of the hundredth meridian. Before the passage of this act, a comprehensive plan of surveys was submitted to the Engineer Department, which was ratified and adopted as the basis on which future surveys by Lieut. Wheeler should be made. The plan was, briefly, to divide the territory lying west of the hundredth meridian into eighty-five equal rectangles, and to work up each of them with rigorous exactness, and publish the results from time to time, in connection with an index-map of the whole area embraced, each small map being thrown up to ten times the size in the index-map, so that, by turning from one to the other, a complete knowledge of the country in its relative and detailed character can be obtained. The "importance," says Lieut. Wheeler in the communication he has sent me, "of accurate and frequent maps in connection with Western surveys has long been apparent to my mind, not only for their obvious convenience as maps of reference for the traveller and the emigrant, but as being the essential ground-work on which all explorations and investigations should rest, and to which the after-labors of the geologist, the miner, and the capitalist should be referred." In connection with the perfected Engineers' map, a series of maps or charts might easily, he says, be arranged, covering a variety of topics, and exhibiting an epitome of all researches and scientific observations in the regions embraced. "In which service," he continues, "I may mention an historical map on which, with appropriate markings and colorings, the lines of the earliest explorers, and the area of each and every survey that has been prosecuted, should be carefully designated; a map of climatology, covering a multitude of features; an agricultural map, showing the lines of demarcation between different belts of country in their adaptability to cereals and fruit; a mineralogical map, necessarily fluctuating in accuracy and completeness, detailing the most recent and well-established specifications in regard to mining areas, either by itself, or in connection with the agricultural map; a map of mountain, desert, and arable land, with diagrammatic exhibition of areas where irrigation and Artesian wells are necessary and considered practicable; and so on, through quite an extended series. The amount of information which would be easily imparted by such a system of charts, and which could be extended at will to cover an increased variety of topics, would be very great."

As an important factor in the accurate making of maps, "astronomical observations," he writes, "have been employed to a large extent, and I am happy to state that I have been enabled to collect a measurably complete and valuable set of observations from a corps of trained assistants, stationed not only at different points in the territory surveyed, but at more distant points, such as Cheyenne, Fort Steele, and Green River Station on the Union Pacific road, from which communication was established with the main observatory in Salt Lake City, the Mormon observatory at the latter place being placed at my disposal by Brigham Young."

"The importance of these observations," he says, "in perfecting a survey, where so many physical obstacles prevent accurate geodetic work, can hardly be overestimated. Whilst regarding map-work as the first in the line of the surveyors' and explorers' work, and as the basis for all that accompanies it, I have not allowed the various departments of meteorology, geology, natural history, mining, and other industries to be dwarfed in importance or restricted in action. Besides constant and valuable work in all these departments, much attention has been given to numerous allied topics, such as irrigation, routes for roads and railways, and the needs and possibilities of the different regions traversed. An attempt has thus been made, as should always be the case, to connect the work of the survey with the industrial interests and special development of the Western country, where science, pure and simple, can hardly be expected to take root as yet, but should go hand-in-hand with practical utility and the needs of the peculiar stage of development of the civilization which covers it."

The main office-work of the expedition is at present concentrated on the preparation of the five volumes which are to cover the season's field labors. These volumes are to be condensed to the greatest brevity possible, without the sacrifice of valuable material, and will comprise about one hundred and seventy-five pages quarto each, if possible. The result of the season will be segregated into appropriate departments, and the volume issued accordingly. The greater part of the thirteen of the projected eighty-five rectangles are in process of compilation, five having been added during the last year, and their publication in map-form, with an index-map, will be made as speedily as the careful mechanical execution of the work can be effected.

CAPT. BARLOW'S EXPEDITION TO THE SOURCE OF THE YELLOWSTONE RIVER.

The reconnoissance of Captain Barlow has been in the basin of the Upper Yellowstone River, and was made in the months of July and August, 1871, for the purpose of examining the source of the Yellowstone; the result of which, in the form of an official report, was laid before Congress last April by the Secretary of War. The report is one of exceeding interest, giving a detailed description of the region traversed, being in part over the same field of operations covered by the geological expedition of Prof. Hayden. It embraces the general geography of the region, the mountain forms, the peaks and heights, the streams that connect with the Yellowstone, the waterfalls and cañons ; an elaborate description of the basin of the Great Geyser, or hot spring, "a thorough solution of the wonders of which," says Capt. Barlow, "is to be attained only by long and patient observation by a corps of observers at different points;" the thermal springs ; the calcareous deposit known as Soda Mountain ; the mud volcanoes and the lakes which are tributary to Snake River. From the summit of a mountain 10,400 feet above the level of the sea, which Captain Barlow named Mount Hancock, he and his party obtained what he calls an unparalleled view of a vast extent of country, bounded by the Gallatin Mountain and Elephant's Back on the north, the Yellowstone range on the east, the Wind River range on the south, and the Great Teton range on the west. To the report is attached a most valuable map of the region traversed, delineating the curvatures of the mountain forms, the position and shape of the Yellowstone Lake, and the course of the great cañon of the Yellowstone. The meteorological records and the numerous and interesting specimens collected in this reconnoissance were unfortunately destroyed by the great fire in Chicago.

CAPT. JONES'S EXPLORATION IN THE UINTAH MOUNTAINS.

The exploration and surveys of Capt. W. A. Jones have been in the Uintah Mountains in Utah; the Uintah range is a spur of the Wahsatch Mountains, beginning in lat. 40° 30′ N., with an altitude of about 12,500 feet, and thence tending north-easterly to Green River, where the spur terminates. The extreme elevation of the range is in the vicinity of Gilbert's Peak, where the mountains reach to about 13,500 feet, and the whole region is one hitherto comparatively unknown. The object of this expedition was to ascertain the character and extent of the valleys through which the streams run flowing from these mountains; the nature of the timber, and the adaptability of the valleys for cultivation and settlement, and especially the examination of the country in the vicinity of Green River, with reference to the supposed existence there of large mineral deposits. He found the mountain-slopes covered with extensive forests of young growth, showing that extensive fires have ranged there for long intervals. The valleys were numerous, deep, and narrow, extending quite to the summit. The enormous basins that range along either side of the summit-line, he thought, from their position, must be filled in the winter with great drifts of snow, furnishing in the summer a continuous supply of water to the numerous mountain-streams. The whole region, mountain and plateau, he says, is especially adapted for grazing, grass being found everywhere, even to the mountain-summit; and, as there is always water, he thinks that a pastoral people could live quite comfortably in these mountain-valleys. He speaks highly of the region watered by the North Uintah River, having everywhere a superabundance of grass, wood and water, and a climate incomparably fine. The mineral deposits were found to be unimportant, and a noticeable feature of the whole region was the scarcity of birds, reptiles, and insects.

PROF. POWELL'S EXPLORATION OF THE COLORADO RIVER.

Prof. J. W. Powell has, during the year, continued his survey of the Colorado River, under the auspices of the Smithsonian Institution, and has made his second preliminary report. He has continued the examination of the wonderful series of cañons along the course of the Colorado, and has visited a group of volcanic mountains north of the Grand Cañon, to which he has given the name of the Uinkaret Mountains. The work done during the year has developed a most remarkable series of faults and folds in the earth's crust, which, in the opinion of Prof. Henry, will be of the highest interest to the geologist.

An extensive series of faults running northerly and southerly across the Grand Cañon were examined; some of them, as far as the Wahsatch Mountains. The fissures of these faults have been vents for volcanoes, and are from 50 to 200 miles in length. Discoveries were also made of coal, salt and metals. The number of the houses found of the prehistoric inhabitants of this region has, by the discoveries of this year, been increased to about one hundred; one being situated on the crater of a volcanic cone. The collection of rock-inscriptions, or picture-writing, has been much enlarged. The Seven Cities, called by the Spaniards the Province of Tusayan, were revisited for ethnological purposes, and the passage of the Grand Cañon, in boats, was again successfully accomplished, although attended, at one time, by great peril in consequence of the sudden rising of the river during the night.

SURVEYS FOR THE NORTHERN PACIFIC RAILROAD.

The Northern Pacific Railroad has, during the year, been extended from Moorhead on the Red River of the North, to the Missouri River, opposite the mouth of the Heart River, a distance of 198 miles, making, so far, a continuous line from Duluth, at the head of Lake Superior, of 450 miles, showing the energy and celerity with which this great work has been carried on. The surveys in connection with the work have been very extensive, embracing a reconnoissance upon the Missouri River of 2,300 miles; a preliminary survey east of the Rocky Mountains of 250 miles; one of the like character in the Rocky Mountains of 700 miles, and upon the Pacific Slope and over the Cascade Mountains of 1,727 miles. There have been, east of the Rocky Mountains, amongst the mountains, and along the Pacific Slope 1,165 locations, the railroad surveys and locations amounting to 3,843 miles, or about twice the length of the main line between Lake Superior and Puget Sound. The data, from these surveys made during 1872, chiefly between latitude 45° and 49° N. will, when elaborated, add greatly to our geographical knowledge of this most important and interesting region.*

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*As this survey is one of great interest in this country the following account of it, in detail, is given, from the communication received from Gen. Roberts:

During the season of 1872, the Company extended their road across the Territory of Dakota, on a nearly east and west line, from Moorhead, on the Red River of the North, to the Missouri River opposite the mouth of Heart River, a distance of 198 miles, making a continuous line from Duluth at the head of Lake Superior, of 450 miles.

Additional surveys were made from the mouth of Heart River to the western boundary of Dakota Territory, and beyond into Montana Territory, crossing the Little Missouri River and extending to the junction of the Powder River with the Yellowstone; a distance of 250 miles. This survey was conducted in the field under the direction of D. C. Linsley, Assistant Chief Engineer, and Gen. T. L. Rosser, Division Engineer, with a Government escort under the command of Gen. Stanley, U. S. A.

A survey was also made along the Musselshell River, from a point near its great bend to its sources in the Belt range, a spur of the Rocky Mountains, and thence over by a favorable pass, and down Sixteen Mile Creek to the Missouri River, and connecting at the "Three Forks" of the Missouri with the initial point, "departure point one," a distance of 173 miles. This survey was conducted in the field by Col. John A. Haydon, Assistant Engineer, with a Government escort under the command of Col. E M.

W. H. DALL'S EXPLORATIONS IN THE ALEUTIAN ISLANDS.

Mr. W. H. Dall's investigation in connection with the geography and hydrography of the Aleutian Islands has been carried on during the year under the auspices of the Coast Survey, his headquarters being at Illuluk, Oonalaska. He has discovered in these islands the remains of a people antecedent to the race that now inhabits them. Around the sites of ancient villages he found burial-caves in which the dead bodies had been placed,

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Baker, U. S. A. This survey disclosed an additional practicable railroad-line by the Sixteen-Mile Creek Pass, which connects advantageously with the several lines surveyed in 1871, across the main range of the Rocky Mountains.

A reconnoissance of the Missouri River was made during the season of 1872, extending from the proposed crossing of the Missouri at Heart River to the head of the Missouri River, at "departure point one," above mentioned, embracing about 1,300 miles—including a survey for a railroad around the Great Falls of the Missouri (21 miles). This examination also covered the reconnoissance of the River from Sioux City to Heart River. It was made for the purpose of ascertaining the character of the navigation in detail, and the work required for its improvement. It was conducted by Mr. Thos. P. Roberts, Assistant Engineer.

A survey was made on two additional routes crossing the main range of the Rocky Mountains; one by an extension of the survey of 1871, up the Wisdom River to its sources in the Bitterroot range of the Rocky Mountains, and across the summit to the head-waters of the Salmon River, and down the Salmon River to its junction with the Snake, or Lewis' Fork of the Columbia River ; and thence down the Snake River to Lewiston at the mouth of the Clearwater, one of its tributaries, where it connects with the surveys of 1871. The surveys up the Wisdom River were conducted by Mr. M. T. Burgess, Assistant Engineer, and the surveys down the Salmon River were conducted by Col. W. W. de Lacy, Assistant Engineer.

The unfinished surveys on the Missoula River were resumed, and a line was located from the town of Missoula, in Montana Territory, down Clarke's Fork of the Columbia River to Lake Pend d'Oreille, a distance of 207 miles. This work was conducted by Mr. James Beltner, Assistant Engineer. A survey was also made by him from the Fishery Creek, over the Bitterroot range, down to the North Fork of Clearwater, connecting with the survey of Col. Eastwick made in 1871, from Lewiston up the North Fork.

An additional route was also traced over the main range of the Rocky Mountains in the vicinity of Mullan's Pass, passing in the vicinity of Helena, and gayly dressed, some being encased in wooden armor. The bodies were so placed and arranged as to indicate their ordinary occupations;—men in canoes, as in the act of rowing; women dressing skins, holding children, etc., etc. This method of burying in canoes was common among the South-American Indians, but had not hitherto been known to have been practised by the North-American tribes. Mr. Dall is preparing an Arctic flora and fauna, and his forthcoming work will be of interest alike to the geographer, the archæologist, and the naturalist. This very capable and industrious young

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by Mr. T. P. Roberts, Assistant Engineer, making a shorter line than the route via Ten-Mile Pass, surveyed in 1871.

In addition to these, a large amount of surveying and location of lines was accomplished during 1872, on the Pacific Slope, westward of the region already referred to, under the immediate direction of Thomas B. Morris, Division Engineer.

A line was located along the Columbia River, by James F. McCabe, Assistant Engineer, from Kalama to the mouth of Snake River, 250 miles; another by R. A. Habersham, Assistant Engineer, from the Cascades of the Columbia to Portland, on the Willamette River, 42 miles; the track of the main line from Kalama northward toward Puget Sound was extended 40 miles, to within 15 miles of Olympia, which is at the southern extremity of the Sound; while a location was made along the eastern side of Puget Sound to Sehome, on Bellingham Bay, 232 miles from Kalama. These locations were made by R. A. Habersham and Geo. H. Birnie, Assistant Engineers.

Lines were also run from the main line to various points on Puget Sound. Preliminary surveys were made between the mouth of Snake River and Lake Pend d'Oreille, by Mr. Hubert C. Ward, Assistant Engineer. The line was afterwards located over the same general region by Col. P. G. Eastwick, Assistant Engineer.

Mr. Ward made a survey from Lake Pend d'Oreille across the Columbia Plains to the Wenatchee, and up the river to the summit of the Cascade range of mountains, where he was met by a line surveyed by Mr. J. T. Sheets, Assistant Engineer, from Puget Sound up the Skagit River. These surveys give the shortest practicable line between Lake Pend d'Oreille and Puget Sound.

Mr. Ward surveyed several passes in the Cascade range, bringing them into connection with the lines just mentioned; so that much has been added to our topographical and geographical knowledge of the Columbia plains, and of the Cascade range of mountains.

explorer has been recently engaged in hydrographic explorations in the Northern Pacific, and has just returned to San Francisco, where he is preparing the report of his latest labors for the Government.

THE HYDROGRAPHIC BUREAU'S SURVEY OF THE NORTHERN PACIFIC.

An expedition has been organized by Commander Wyman, Chief of the Hydrographic Bureau of the Navy Department, for a more complete geographical exploration of the seas between our Pacific coast, China and Japan, and for the construction of more accurate charts; our increasing and important commerce in this direction demanding a more accurate survey of this part of the Pacific. An observer has been stationed during the year at St. Paul, in the Aleutian Islands, by the Signal Service Bureau, which observer, in addition to his meteorological duties, is to examine as far as possible the temperature of the sea in that vicinity, to note the tides, the passage of ice through Behring Strait, the movement and temperature of the Japanese current, if arrested and thrown upon the American coast by the blocking-up of the Strait, and to preserve specimens of the drift that may be picked up.

THE DARIEN EXPEDITION.

In the winter of 1870, the Government of the United States sent out an expedition, under Commander T. O. Selfridge, U. S. N., to explore the practicability of the several routes suggested for an interoceanic canal through the Isthmus of Darien. He surveyed the several proposed routes, commencing at Caledonia Bay and the Gulf of San Blas, and found them to be totally impracticable. In the winter of 1871, another expedition was sent out under the same commander, to explore the route by the Atrato and Tuyra rivers, which was done, and was likewise found impracticable. Another route was also surveyed by the way of the Atrato and Napipi rivers. This route the exploring party were unable to examine as fully as had been desired, in consequence of the coming-on of the rainy season; but they succeeded in completing a line of survey from the Pacific to the Atrato, and the indications were so favorable that the Government sent out another expedition at the close of last year, under Commander Selfridge, to complete the survey. Commander Selfridge is to begin on the Pacific side in the Bay of Cupica, about ten miles below the former points of exploration, where he expects to find a depression. Very favorable expectations are formed in respect to the result of this survey; and if a canal by this route be practicable, and should be constructed, it would reduce the distance for sailing vessels between New York and Hong Kong from 110 to 83 days, making a difference of twenty-seven days. There is also an expedition for the survey of the Nicaragua route, under the direction of Commander Lull, U. S. N., which our member, Mr. Body, who is familiarly acquainted with the different parts of the isthmus, thinks will prove to be the most practicable. In a few months we shall have definite information in respect to both of these routes.

THE AMERICAN PALESTINE-EXPLORING EXPEDITION.

The American Palestine-Exploration Society has recently despatched an expedition to Syria, under the charge of Lieut. E. Z. Steever, of the U. S. Engineer Corps, for the exploration of the country east of the River Jordan, and of the northern part of Syria. The expedition consists of Lieut. Steever and three associates from this country, with whom will be united, in the field of exploration, a certain number of educated and trained natives of Syria, making together a very effective body for the prosecution of the geographical and archæological labors of the expedition, which will extend over a period of three years. The expedition is one of great interest to the geographer, the Biblical scholar, and the archæologist, as the region to be explored is almost unknown, and is one to which the attention of those interested in these respective fields of inquiry has long been directed.

THE SIGNAL SERVICE.

Nothing in the nature of scientific investigation instituted by the National Government has proved so acceptable to the people, or has been productive, in so short a time, of such important results, as the establishment at Washington of the Signal Service Bureau. It has been in operation only since November, 1870, and in this limited period it has become, through the efficiency of Brig.-Gen. A. J. Myer, the Chief Signal Officer, and his three able assistants, Profs. Cleveland Abbe, Thompson B. Maury, and the Acting Signal Officer, Lieut. R. Craig, one of the most complete organizations of the kind in the world.

At the commencement of 1871, the territory occupied by the stations of observation was mainly that of the United States, — to the east as far as Portland in Maine, thence along the Atlantic coast and the Mexican Gulf, very nearly to the Rio Grande, and along the southern shores of the great lakes, and throughout the interior, as the interests of the Service required. During the year reports were also received from stations located at wide intervals on the elevated plateau lying between the Missouri valley and the Pacific Slope, and from three points upon or near the Pacific coast.

During the past year the Service has been extended within the United States by the addition of several stations lying between those which were already established, and of several points of observation located in the valley of the Red River of the North, the peculiar meteorological conditions of which furnish an interesting source of study.

Beyond the United States, through the coöperation of the Canadian Government, the Service has been extended northward, in the valley of the Red River, to Fort Garry, in Manitoba; thence along the northern shores of Lakes Huron, Erie, and Ontario, and down the valley of the St. Lawrence as far as Quebec.

Reports are also received from Halifax, Nova Scotia, and it is thought that arrangements will be made by which reports may be had from the islands of Cape Breton and Newfoundland. From the localities enumerated, telegraphic reports are received daily at the Chief Signal Office at Washington, and from them are deduced the daily forecasts of the weather. This branch of the Service has proved especially valuable, a comparison of the daily forecasts or probabilities with the meteoric condition, as afterwards ascertained, having given up to November 1st, 1871, an average of sixty-nine per cent, and from that date to October 1st, of last year, an average of verification of seventy-six per cent.

The summit of Mount Washington, N. H., has been occupied as a signal station for the past two years, and Gen. Myer expects to obtain reports from some of the loftier summits of the Alleghanies farther South during the present year. It is also probable that reports will be received from some peak of the Rocky Mountains during the ensuing summer.

As soon as it is practicable it is the intention of the department to establish a station of observation in the Sandwich Islands, from which, it is hoped, warning may be received of any meteoric disturbance originating perhaps on the coast of Asia, and destined to reach the Pacific coast of the United States.

It is also expected by the Chief Signal Officer that, during the present year, arrangements will be made for the receipt of telegraphic reports from various points in the West India Islands, which, it is hoped, may enable the department to announce the approach of many of these cyclonic storms, the presence of which is now only known when they strike the southern coasts of the United States. As an additional aid in the tracing of these storms, regular observations are made upon several of the steamships plying between New York and the Isthmus of Panama, and it is thought that arrangements will be made whereby it will be possible to obtain a continuous record between this country and Europe by means of regular observations upon the transatlantic steamships.

Gen. Myer remarks in his report that sometimes observations made in Great Britain seem to indicate the presence there of disturbances traced out to sea from our shore; and, if the arrangements anticipated should be carried out, there will be from our remotest stations on the Aleutian Islands to Great Britain a connected line of observation, extending over nearly half the circumference of the earth. It is impossible to estimate too highly the importance of regular observations of this nature, in connection with those which have now been extended over a considerable portion of Europe. Humboldt, in treating of magnetic observations, has especially dwelt upon the greater value of those which have been regular and continuous over those that are taken at intervals, no matter how widely, over the earth's surface, and this remark applies with equal force to meteorological observations. "The Signal Service," says a writer in the *New York Herald*, "has given timely forewarning of the heavy storms upon our sea-coast and lakes, of the heavy rainfalls and floods, of the early arrival of frosts, and of the cold tidal air-waves which cover the land with snow;" and this kind of information has become so varied, extensive, and valuable, that it is in contemplation by Mr. E. R. Esterbrook, of the Signal Service of this city, to establish a monthly meteorological journal for the more regular and general diffusion of the facts, the deductions to be drawn from them, and the advancement of the science of meteorology generally, which, I trust, will receive, as it deserves, a wide public support.

METEOROLOGY.

At the anniversary meeting of the Meteorological Society of London, last August, the president, Mr. Tripe, in his annual address, called attention to the valuable results obtained through meteorological observation upon the course of epidemics and the influence of high and low temperatures upon the public health. He said that the conclusion among meteorologists was tolerably uniform that very cold and very hot weather induce an increase in the number of diseases and deaths; that a cold, wet summer always coincides with a less amount of sickness and fewer deaths than a hot, dry summer; that very cold weather causes a great increase in the sickness and mortality of any given population; and that the increase extends to all kinds of diseases. That, for instance, small-pox increases as the temperature sinks below, and scarlet fever as it rises beyond, certain points; and that the influence of all other meteorological elements upon disease is almost inert as compared with temperature. He expresses the opinion that statisticians will eventually be enabled to determine the precise relations which exist between the state of the public health and meteorology; so that, in addition to the knowledge which these observations give us of the movements of the atmosphere and of the law of storms, we have also the expectation that they will shed additional light upon diseases and their causes.

AMERICAN GEOGRAPHICAL PAPERS.

In closing this record of our own labors during the year, I would call attention, finally, to the many valuable papers that have appeared in the course of the year in various periodicals, among which may be especially named the paper of Prof. J. Le Conte, of California, entitled, "A Theory of the Great Features of the Earth," in *Silliman's Journal*,—a paper of great interest and value,—in which the professor does not assume to give an entirely satisfactory theory (for he concedes that the state of our knowledge does not yet admit of it), but claims to direct attention to what he insists is the true direction of inquiry. The paper of J. W. Foster, LL. D., in the *Naturalist*, on the mountains of Colorado, their topographical features, geology, vein-phenomena, climate, the effects of electrical phenomena in their vicinity, and the evidence of post-glacial action; and Mr. Muir's observations in the *Overland Monthly*, on the glaciers of the Sierra Nevada. Dr. J. P. Widney's paper, in the same periodical, on the Colorado desert, which he supposes, at a past period, to have been a portion of the Gulf of California, which then, he thinks, extended about 200 miles above its present limit. This upper portion, in his opinion, was cut off, upon the east side, by the Colorado River, depositing quicksand in its thick floods and a deposit of red mud from the great plateau of Northern Arizona, until the upper part, with an area of 180 miles in length and an average of thirty miles in width, was completely separated from the Gulf, and elevated into a barren desert, becoming, as he says, a disturbing element in the climate of Southern California. It is now, to use his own language, "a huge furnace, from which withering blasts make forrays upon the favored territories around;" and he calls attention to the importance and possibility of turning the river into it, and converting what is now a desert into an inland lake. And, lastly, Prof. T. B. Maury's paper, in the *Popular Science Monthly*, upon the Law of Storms, as developed by the collected observation of the U. S. Signal Service.

POPULATION OF THE UNITED STATES.

The Government published during the year the results of the census of 1870, by which it appears that the total population of the United States is 38,589,377.

The mixed population of the city of New York consists of: Native-born, 523,198; foreign-born, 419,094,—the excess of the native over the foreign being 104,104. The foreign population of the city of New York is thus distributed:

Irish	201,999
Germans	151,216
Austrians	2,737
English and Welsh	25,026
French	8,265
Scotch	7,562
Canadians	4,419
Poles	2,393
Swiss	2,178
Swedes and Norwegians	1,930
Dutch	1,237

The largest foreign population in proportion to the whole is in the city of New York. In this order Chicago stands next, then St. Louis; after St. Louis, Cincinnati, and then Philadelphia. In New York and Philadelphia the Irish outnumber the Germans. In Chicago, St. Louis, and Cincinnati, the Germans outnumber the Irish. In Cincinnati they are nearly three times as great; in St. Louis, nearly double; and in Chicago, about one-third more. In Philadelphia the Irish are nearly double the number of the Germans, and in New York they are about one-third more. The foreign population concentrates chiefly in the commercial cities, and in the manufacturing and mining districts of the eastern portion of the United States, and is largely distributed over the Western States. In the Western States the foreign emigrants are mainly found in the vicinity of lakes and rivers. They rarely settle in the mountain-districts, and prefer the wooded country to the prairie. The Scandinavians seek the far States of the North-west, three-fourths of the Swedes and Norwegians being in Minnesota. The Irish are in the large cities, and in Massachusetts, in Connecticut, in North-western New York, in Northern Illinois, and in North-eastern Ohio. The Germans are largely represented in the cities, are widely extended over the Western States, and have avoided New England. The English and Welsh are found chiefly in or about the cities of New York, Boston, and Philadelphia, or wherever there are coal-fields or great iron-works. The Latin races, so-called, are relatively small. They do not, including Mexicans and South-Americans, equal the emigration from the kingdom of Bavaria alone. The Italians are but 17,149, and the Spaniards only 3,701, and of this small number one-third are in New Orleans.

ARCTIC EXPLORATION.

In the beginning of the year great interest was manifested in the subject of Arctic exploration, for, apart from the geographical achievement of reaching the North Pole, it has now become apparent that Arctic exploration is of the highest importance in a scientific point of view, when it is accompanied with meteorological, barometrical, and astronomical observations, and an investigation of the Arctic fauna, flora, geology, and paleontology, in the latter of which departments of knowledge it has proved to be one of the most instructive of fields for the light which it sheds on the past physical history of the globe. It was hoped that this year would be especially propitious, as the summer of 1871 had been very favorable to exploration. The inhabitants of the most northerly settlement in Greenland told Dr. Bessells, of Capt. Hall's expedition, that there had not been so warm a summer for fifty years, and the effect of it was seen in an enormous drift of ice-fields southward from Smith's Sound and Baffin's Bay along the coast of Newfoundland from

February to May. "It may be affirmed, without exaggeration," says a writer from St. John's, Newfoundland, in May last, "that a river of ice, varying from 60 to 200 miles in breadth and 2,000 miles in length, has been for three months incessantly pouring its contents into the tepid waters of the Gulf Stream."

The experience of the two preceding years, 1869 and 1870, also gave great encouragement, especially in respect to that region of the Arctic between Spitzbergen and Nova Zembla. Capt. Palliser, a walrus-hunter, reached, in 1869, half a degree beyond Cape Nassau, and in his opinion, could then have sailed entirely around Nova Zembla. Capt. E. H. Johannsen, without any difficulty, traversed the entire Carian Sea twice, following its east and west coast without being disturbed by ice or seeing any considerable quantity of drift-ice in the entire sea. In 1870, the Norwegian fishermen reached the north-east coast of Nova Zembla, and remained on the coast until the latter end of October. During the same year Captain Johannsen sailed around the whole of Nova Zembla, which had never been accomplished before, and, in 1871, Captain Mack sailed along the west coast of Nova Zembla, 500 nautical miles, and reached Cape Nassau in the beginning of July, finding upon the islands violets, buttercups, and other flowers.

All this was very encouraging, so much so that the eminent geographer Petermann confidently expressed the conviction that a stanch steamer could pass from the Scandinavian coast through the Arctic Ocean to Behring Strait and return the same summer, to which should be added, that the result of the inquiries made at the Helder a century ago was, that the Dutch fishermen had always penetrated farther north in this part of the Arctic than in any other. Great expectations were consequently formed of what would be accomplished during the past year in this particular locality, which, I regret to say, have not been realized. A Russian expedition was talked of, but nothing came of it. The long-projected French expedition for the exploration of the region between Nova Zembla and Behring Strait, which was to be commanded by Captain Mack, an officer experienced in Arctic exploration, it was anticipated, would sail; but, for some reason, the expedition was indefinitely postponed. Five expeditions, however, started,—Mr. Leigh Smith, in his yacht the "Samson;" two Norwegian expeditions, a Swedish expedition, and the Austro-Hungarian expedition. To this should be added explorations and discoveries by Capt. Nils Johnson, in Norwegian vessels upon the east coast of Spitzbergen.

Mr. Leigh Smith sailed in his yacht, toward the close of July last, with the intention to push his way to the east coast of Greenland, but was stopped by the ice. He then determined to attain the highest latitude possible, and afterward to attempt the examination of Spitzbergen. But it proved to be an unusually close season both on the western and the northern side. He reached only to 80° 30′ N. lat., less than he had attained the previous year. The yacht was beset by ice, sprung aleak, and Mr. Smith was compelled to return.

The Norwegian expedition consisted of two vessels, commanded by Capts. Jensen and Hansen. Its object was the circumnavigation of Spitzbergen. It was equally unsuccessful. One of the vessels damaged her screw, which disabled her; and the other, from inability to find an entrance through the masses of ice, was compelled to return to Bergen.

The Swedish expedition is one of great interest. It consisted of three vessels, — the steamer "Polhem," the steamer "Gladen," and the brig "Ouke Adam" — the expedition being under the general superintendence of Prof. Nordenskjöld, the eminent Swedish *savant* and Arctic explorer. This expedition was mainly equipped by funds subscribed in Gothenburg; and, from the accounts which I have read of its fitting out, it is, I should think, for the combined purpose of scientific investigation and geographical discovery, the most thoroughly equipped expedition that has ever entered the Arctic seas. It started last summer, and the plan agreed upon was to pass the summer and autumn in explorations upon the east coast of Greenland, to winter in Mossell Bay, and next spring to reach the pole by sledge-travelling, for which every preparation had been made. Whether the expedition succeed in this or not, its further work will be to explore the Eastern Spitzbergen Sea, and to map the whole of the eastern lands, including the mysterious Gillies land; and a material part of the labors of these Swedish scientists will be to take meteorological, thermometrical, and magnetic observations, and do what they can for the science of zoölogy.

The steamer "Polhem" is the principal vessel. The other two were to have returned at the close of the summer; but as they failed to do so, great anxiety was felt in Sweden, for these two vessels had not been equipped to pass an Arctic winter. For this purpose a steamer—the "Albert"—was despatched with supplies, the hope being entertained, notwithstanding the lateness of the season, that she would be able to communicate with them. I am happy to say that news was received two months ago that the three vessels were in Mossell Bay, where they were to pass the winter—a point at which the succor brought out by the "Albert" may possibly reach them. Another expedition sailed from Sweden during the year to establish a colony on the southwest coast of Spitzbergen, the object being mercantile,—the obtaining of phosphates for artificial manure. If such a colony be established in Spitzbergen, it will be of great use in explorations, like the Danish settlement in Greenland, as a point to keep up communication and a depot for supplies.

The Austro-Hungarian expedition consisted of two vessels,—the steamer "Tegethof," the chief officers of which are Lieutenants Weyprecht and Payer, and the yacht "Isbjorn," of Count Wilczek. It will be remembered that Weyprecht and Payer, in the preceding year, made an exploration of the sea between Spitzbergen and Nova Zembla, in the yacht "Isbjorn," which was preliminary to the present expedition. The object of the expedition, which was to be mainly carried out by the steamer "Tegethof," was to penetrate the sea east of Nova Zembla, and proceed, if possible, as far as Behring Strait, the main object being to explore the land lying to the north in that direction, which, it was supposed, would be facilitated by the warm currents of the Siberian rivers that terminate in this portion of the Arctic basin. If no land should be discovered at the North, then the "Tegethof" was to winter at Cape Tscheljuškin, the northernmost point of the continent of Asia. If it should prove impossible to reach Behring Strait or to return, then the yacht "Isbjorn" was to be abandoned, and Count Wilczek, his scientific associates and crew, were to return in boats by way of one of the Siberian rivers. The vessels reached Tromsö in June, whence the "Tegethof" proceeded and sailed along the western coast of Nova Zembla, encountering very thick ice; and Count Wilczek sailed to Spitzbergen, where, to the north and east, the sea was tolerably open. He attempted to ascend the Horn Sound, but, being unable to do so, sailed southward, where he encountered heavy masses of ice in the vicinity of Hope Island; upon which he sailed for Cape Nassau, Nova Zembla, and had great difficulty in forcing his way through the ice. On the 12th of August the two ships met, in about lat. 76° N., and after keeping company two days they parted, as the ice was everywhere forming; the "Tegethof" to proceed to the North and Count Wilczek sailing for the mouth of the Petchora River, which he succeeded in reaching after great difficulty. Here he and his party abandoned the yacht and ascended the Petchora with their boats for six weeks, when they reached Perm, and from there they found their way to Moscow, about two months and a half ago.

Count Wilczek, in his communication to the Vienna Geographical Society, regrets that the season was so short, considering the rich material they found in Spitzbergen, in a geographical point of view, and says that both it and Nova Zembla yielded a rich harvest of botanical and zoölogical matter. Having with them good instruments, they made meteorological observations and coast and inland surveys. The "Tegethof" was heard from last on the 16th of August. The weather was exceptionally severe, but still Lieut. Weyprecht thought that they would be able to work round the northern part of Nova Zembla, and winter on the Siberian promontory, Cape Tscheljuskin, or as it is otherwise spelled, *Cheljuskin.* He says that they found the modern charts of the coast of Nova Zembla utterly untrustworthy, and that the old Russian charts were the best. He was, unfortunately, unable to make any corrections, as the continued prevalence of fogs and clouds prevented astronomical observations.

The unfavorable character of last summer for exploration, as shown in the result of these several expeditions, which may be attributed to the nature of the preceding winter, which was exceedingly cold, and the fact of the intense cold of the present winter, give rise, very naturally, to some anxiety respecting Capt. Hall and the "Polaris," which has not been heard from since August 5th, 1871. He was then off Tossak Tussuissuk, lat. 73° 21′ N., lon. 56° 5′. W. All on board were well. The sea-going qualities of the vessel had been tested and found favorable; his complement of sixty Esquimaux dogs had been obtained, and Hans Christian, the well-known dog driver, with his family, had joined the expedition. He met, at Hollensburg, Baron Von Otten returning from the Swedish expedition, who furnished him with maps, copies of his log, deep-sea soundings, etc. I earnestly urged Capt. Hall, before he left, to abandon the attempt he proposed making by Jones's Sound and to go by Smith's Sound and Kennedy's Channel, following up the route of Kane and Hayes, which, I was convinced, was the route that offered the most advantages for an attempt to reach the pole, and he concluded to defer his decision until he should reach the Arctic. It appears from the communications received that Baron Von Otten advised him to go by Smith's Sound; and when last heard from he had concluded to do so, and on the 24th of August, 1871, with a full roster of thirty-eight persons, he sailed in his little vessel for Smith's Sound. The advantages of this route over all others, in an attempt to reach the pole, was earnestly advocated last April before the Royal Geographical Society of London by Capt. Sherard Osborn, R. N., upon the grounds that the nearest approach to the pole had been made in that direction, that it was attended with less risk than any other, and offered greater opportunities than the other routes for scientific observation; and this distinguished Arctic explorer and author was supported in these views upon that occasion by the eminent Arctic explorers Admiral Back and Sir Leopold McClintock. Admiral Back said that he approved of every word that Capt. Osborn had uttered; that the Arctic Committee had seriously considered the question, and had come to the conclusion that the route which offered the greatest probability of success was by Smith's Sound, or, as he expressed it, the route taken by the gallant American, Dr. Kane; and Sir Leopold McClintock said that he believed that that route afforded the best chance of reaching the North Pole, and also the safest retreat in the event of a reverse. It is the route which our own eminent explorer, Dr. Hayes, has persistently advocated for years, and is also the one recommended towards the close of the year by the various scientific societies that united in an application to the British Government to fit out another polar expedition.

It is gratifying, therefore, to feel that Capt. Hall is at least in the right direction, and that the summer of 1871, when he sailed for Smith's Sound, was one of the most favorable seasons that have been known for many years. Still, the severe winter that followed, and the severity of the present winter, very naturally make us anxious, as his vessel was not specially built for service in these northern regions and is provisioned only for the year 1873; and it is very much to be regretted that the British Government, which has achieved so much in the field of Arctic exploration, did not respond to the call made upon it to send out an expedition this spring. Whilst upon the subject of the safety of Capt. Hall's expedition, I may mention that Mr. Howarth, in some recent views upon the temperature of northern climates, calls attention to the impression prevalent among whalers, that excessively severe winters in more temperate latitudes are generally accompanied by an unusual degree of mildness in polar regions.

In the year 1594 Barentz, the Dutch navigator, sailed around the north-east point of Nova Zembla, where, finding his further progress blocked by ice, and being unable to return, he and his crew built a hut in a little bay, where they passed the winter and underwent an amount of suffering that is almost without a parallel in the history of Arctic exploration. There is no record that any navigator since has passed the north-east point of Nova Zembla until the year 1871, when Capt. Karlsen, the master of a small Swedish sloop, of sixty tons, called "The Solid," succeeded in doing so and sailing into the little bay. He found the hut still standing, with everything remaining exactly as Barentz had left it 276 years ago. Its interior corresponded exactly with the old engraving of it attached to Gerard De Veer's narrative of the voyage, published in Amsterdam in 1598. The sleeping-berths, the halberts, the muskets, the clock upon the wall, were in the same place. The hut had evidently never since been entered by man. Upon the outside were several large puncheons, and heaps of the bones of the bear, the reindeer, the seal, and the walrus. In the interior were the instruments and books used by the inmates, one of the books being a Dutch copy, in excellent preservation, of Mendoza's Description of China, the country they had hoped to reach by a supposed north-east passage around the pole. A flute was found that still gave out a few notes; a pitcher of Etruscan shape, exquisitely engraved, and drinking-vessels, recalling the touching incident, mentioned by De Veer, of these poor fellows, in the midst of their intense sufferings, asking their captain to let them make merry on Twelfth Night with a little sack and two pounds of meal,—an indulgence bringing to their minds the assemblage of friends, wives, and children, then in the enjoyment of that festive night in their far-off homes in Holland. The articles, about 150 in number, consisting, in addition to those named, of working-tools, cooking-vessels, pictures painted upon tin, an iron box, etc., were brought by Capt. Karlsen to Hammerfest, where these interesting relics were purchased for £600 by an English gentleman named Ray, then on his way to Lapland, who transferred them to the Dutch Government for the price he had paid for them, and during last year they were received in Holland, and are at the Foreign Office at The Hague until the final place of their deposit shall have been settled. All who have read the thrilling account of this early voyage, and of the fate of the intelligent, persevering, and brave commander, whose name has been given to the great bay that washes the western shores of Nova Zembla, will feel an interest in the recovery and preservation of these humble memorials of one of the most heroic of Arctic explorations.

GENERAL GEOGRAPHICAL LABORS.

In leaving the Arctic and our own country, I may enumerate, among the matters of general geographical interest, the Government surveys that are in progress and which are connected with the publication of maps in Great Britain, Sweden, Norway, Denmark, Belgium, Italy, and Austria. The Russian surveys in the Caucasus, in Eastern and Western Siberia, and in Turkestan, and the great survey in India, trigonometrical, topographical, and geological, which has been instituted by the British Government, the results of the two first years of which have recently been published in India. Observations upon changes that have taken place in the earth's level upon the northern shores of Africa, upon the coasts of Patagonia, and evidences observed of the past depression of a large part of South Africa. The proposed new measurements of arcs of the meridian, one to be measured by Gen. Bayer, from Christiania to Palermo, and a proposed prolongation of the French measurement of 1797 across the Mediterranean in the vicinity of Algiers. The fact observed by Mr. Hornstein, of Vienna, that terrestrial magnetism affords a measure of the period of the sun's rotation upon its axis, the observations of Mr. Hornstein leading him to believe that the three elements in terrestrial magnetism—the declination, inclination, and horizontal intensity—run in a cycle of 26.33 days, corresponding with the time of the sun's rotation upon its axis, which is also 26.33 days. Discussions carried on during the year respecting ocean-currents and the general laws of ocean-movements, chiefly between Dr. Carpenter and Mr. Croll; the former maintaining that the oceanic circulation and currents arise from causes produced by the difference of the temperature of the ocean at the equator and at the poles, and the latter disputing this hypothesis, and believing that the oceanic movement is due to other causes. Speculative discussions as to whether the interior of the earth is solid or fluid. The exploration of the group of islands in the South Pacific known as the New Hebrides, in 1871 and 1872, by Lieutenant A. H. Markham, an interesting and valuable account of which was communicated by him during the year to the Royal Geographical Society. The expedition of the "Challenger," fitted out by the British Government at the instance of the Royal Society, for the examination of the great ocean basins of the world, in which will be embraced the contour and form of the ocean's bed, its currents and temperature at various depths; the animals, plants, and other objects found in it in different regions; the transparency of its waters in different parts of the world; the philosophy of the tides; and the geology, ethnology, biology, and botany of those parts of the earth above the waters which may be visited by the vessel. With all of this are to be connected determinations in respect to longitude, daily magnetic observations, hourly meteorological observations; and the relations of barometric pressure to latitudes are to be carefully elucidated. The Atlantic, Pacific, Antarctic and Arctic oceans are to be visited in the course of this voyage, which it is supposed will occupy three years and a half; an expedition, that, in the largeness of its conception and the completness of its equipment, is worthy of the scientific character of the nation that organized it.

An Italian expedition for a voyage around the world has also been instituted, consisting of two vessels, the "Garibaldi" and the "Corvelli." I am unable to state the nature of the investigations contemplated, but infer from what is said respecting it that attention will be especially paid to the hydrography and to an improvement of the cartography of the Pacific Ocean.

ARCHÆOLOGICAL DISCOVERIES.

Amongst the archæological results of the year may be named the discovery of additional lake-dwellings, or, as they are called, lacustrine villages of the prehistoric inhabitants of Europe at Bienne, in Switzerland, and in other parts of Europe. The discovery of the skeleton of a man at Mentone, in France, which is supposed to be of great antiquity. The exploration, by Mr. J. Stevens, of pit-dwellings or tent-circles, at Finkly, near Andover, in England. The discovery, by Col. W. T. Roberts and a party of explorers, of the ruins of what was once a populous city, covering an area of about three square miles in an uninhabited and desolate part of Arizona, beyond the San Juan River, southward and westward, about ninety miles from the boundary lines between Arizona and Utah, and about the same distance westward from a prolongation of the western line of Colorado. The ruins were surrounded by a wall of sandstone about ten feet thick, neatly quarried and dressed, which had crumbled away in many places and was partially buried in the sand that had drifted around it. The entire area within the wall had formerly been covered with houses, built of solid sandstone, without mortar, and which exhibited excellent masonry in their construction. The ruins consisted entirely of stone, not a stick of worked timber having been seen. On the north-west coast of Asia near the Hellespont or Dardanelles, excavations were carried on in the years 1871 and 1872, by Dr. Henry Schliemann, north of the village of Burnarbaski, and to the east of the River Scamander, which have resulted in the discovery, in his opinion, of the site and the remains of ancient Troy, the full details of which were communicated by him to the *New York Herald*, and fill six columns of the issue of that journal of December 21st, 1872 ; a discovery, which, whether it has or has not revealed the site of Homer's famous city, is of great interest as disclosing the ruins of successive settlements, one above the other, upon the same site, in strata of comparative regularity ; the upper part exhibiting the remains of wooden structures, below which were the ruins of the dwellings of a people who built with unburned brick, and who from the religious symbols, the utensils, the implements and the pottery found, are supposed to have been an uncivilized people of the Arian race ; and at the lowest depth of all were the ruins of structures built with massive stones, where a wall was found of huge stones joined together with clay, and the ruins of a colossal tower of solid masonry, forty feet thick, built upon the primitive rock which Dr. S. thinks may have been a tower on the wall and the one which Andromache ascended to sweep the plain in search of Hector. The pottery in the lower strata showed an advanced knowledge of art, and a taste and opulence very far beyond those of the people whose remains were entombed in the successive layers above. Lastly, I may mention Gen. Di Cesnola's discoveries in the tombs in the Island of Cyprus, a collection gathered from the exploration of more than 8,000 tombs during the last three years, and embracing more than 10,000 distinct and different articles. Glass of all forms, fabrics, and varieties, terra-cotta, statuary of various kinds, sizes, and periods, in bronze and in stone; vases, gems, and carved stones, jewelry, lamps, mirrors, weapons, utensils, implements, etc. Before this discovery few, if any, products of Phœnician art or manufacture were known, whilst here they are very numerous, combined with objects exhibiting the different stages of Egyptian, Assyrian, and Grecian art. As a collection representing the progressive development of ancient art, nothing like it has ever been obtained ; and it is gratifying to know that the collection has been purchased by John T. Johnson, Esq., of this city, and is to form a part of the Metropolitan Museum of Art of New York.

ASIA.

A great deal has been done during the past year to enlarge our knowledge of Asia, and especially of that part of it from which the civilized world has been so long cut off through the jealousy of the local Mahometan rulers. The advance of the Russians in Turkestan has been followed by geographical explorations and surveys on their part, with which have been connected barometrical and meteorological observations, and the advance during the year of a Turkish force into Arabia Felix, and the occupation by it of Sanaa, the ancient capital of Arabia, and the modern capital of Yemen, will lead to a more extended knowledge of this fertile portion of Arabia, of which we know comparatively little since the visit of Niebuhr in 1763. In 1870, Capt. Miles and M. Werner Munzinger, C. B., explored a portion of the interior of the southern part of Arabia, extending from Aden over three degrees of longitude, and Baron Von Maltzan has since been engaged in making researches upon the geography of the western part north of Aden, between the Strait of Bab-el-Mandeb and 48° E. lon., the results of which he has communicated in an interesting paper to the Royal Geographical Society. A corps of English engineers, under Major St. John, in exploring routes in Central Asia for a telegraph, have traversed portions of Persia, upon the eastern boundaries of it, hitherto almost unknown; and Mr. Blanford, in connection with this expedition, has been examining the geology of the coasts of Persia and of Beloochistan, on the Persian Gulf and the Arabian Sea. The Russian Government has had under consideration a plan for connecting the Caspian Sea with the Black Sea by a canal, which, though it will be but the length of a German mile, is a work of such gigantic magnitude that it will require the labor of 32,000 workmen for six years to complete it. It is doubtful, however, whether the advantages, commercial or otherwise, that would result from connecting the two seas are of sufficient importance to justify the enormous expenditure that would be requisite for the execution of the work. A railroad is also projected eastwardly from Scutari on the Bosphorus, and south of the Black and Caspian seas, to

Teheran, in the north-eastern part of Persia; thence to Herat, in Afghanistan, and from there south-easterly to Shikapore, in India. This project is one in the interest of the British Possessions in India, and if undertaken would doubtless be an English enterprise. A much more feasible and practical railroad route across Asia, it is supposed, would be one to be built in the interest of Russia, from Moscow through Nizhnee Novgorod to Tomsk, thence to Irkootsk, and from thence south around Lake Baikal, and across the Khalkas desert to Pekin, in China. Well-informed Russian gentlemen, with whom I have conversed, regard this route as a very important one in respect to the country through which it would pass. They consider it feasible, and anticipate no serious difficulty in carrying the road across the Mongolian desert in its approach to China. Mr. Prjevalski, a Russian traveller, has been engaged in the exploration of the south and south-eastern portions of Mongolia to the northern boundaries of the Chinese province of Hansu. He designs to explore the Aliakhan Mountains, and expects to make his way to Russian Turkestan, across the western portion of Thibet. Mr. Fedchenko made an important journey through Khokan as far as Gulcha on the east, and to the Alaï Plateau, and has collected a mass of information that will throw great light on the geography of that part of Asia. His journey in Southern Mongolia occupied ten months, and embraced a general survey of the country, meteorological observations, the collection of zoölogical and ornithological specimens, and a great variety of plants, insects, and specimens of minerals.

Mr. Staritzi, who has been engaged for five years in investigating the hydrography of the Sea of Japan, has returned during the year, and laid the results of his labors before the Russian Imperial Geographical Society. He has determined the longitude of thirty-eight different points within an area embraced between 15° N. lat., and 120° and 160° E. lon. His labors embrace observations on the coasts of Manchuria, the Island of Sega lien, the Okhotsk Sea, Kamtchatka, Japan, and the Chinese waters ; an examination of the temperature of the Sea of Japan at different depths ; the measurement of various heights in Kamtchatka, in which was included the volcano of Koriah, which he found to be 11,000 feet high, and a large number of meteorological observations. Capt. Fisler, a Russian officer of engineers, has explored the River Ili from the extreme eastern limit of the Khanate of Kuljah to the Balkash Lake, in Asiatic Russia, into which the river flows.

The results of the expedition under Maj. Sladen, instituted by the British Government in 1869, to explore the trade route between Burmah and China by the River Irrawaddy to Bhama, and thence to Momien, in China, have been published at Calcutta by Dr. Anderson, a member of the expedition. It is a work of great geographical interest, chiefly for the information it contains respecting the Irrawaddy and its sources, a river of the magnitude of the Ganges, which had remained hitherto unexplored. Capt. Burton, the well-known Asiatic and African traveller, has just published a work on the unexplored portion of Syria, and during the past summer he has been engaged in exploring certain parts of Iceland, of which we have little knowledge ; collecting during his trip much geographical and anthropological information. A. Vambéry, the traveller in Bokhara, has given in Mr. Bates's *Illustrated Travels* an account of Dzungaria, or, as it is called on the maps, Soungaria, in the north-west corner of the Chinese empire,—a country recently conquered by the Russians, which extends to the north of Eastern Turkestan, and to the east of the Russian frontier, between 42° and 48° N. lat. And in the same work Mr. A. M. Cameron has begun the publication of a three years' journey in Borneo, the first part of which is especially interesting for a comprehensive account of the great Archipelago, of the islands of Sumatra, Luzon, Celebes, Borneo, and Paqua, or New Guinea, written particularly with the view of calling attention to them as a new and vast field for exploration ; where, he says, reputation can be achieved as great as that of Livingstone. Signori Beccaria and D'Albertes are now engaged in an exploring expedition in Papua, or New Guinea, under the auspices of the Italian Geographical Society. It appears that they have been advised to attempt the western side as the most accessible, but have determined to adhere to their orginal plan of beginning with the exploration of the River Outanata. The corvette "Vittoria Pisani" has since sailed from Japan to Papua, to communicate with these Italian explorers, and to supply them with additional funds sent by the Italian Geographical Society.

AFRICA.

The African results of the year have been the rescue of Dr. Livingstone and the knowledge of the explorations of Dr. Schweinfurth in the regions west of Khartoum and to within three and a half degrees of the equator. The account of the extensive explorations of M. Alfred Grandidier, the French naturalist, in the Island of Madagascar, and the explorations and discoveries of Karl Mauch in the regions north-west of the Trans-vaal Republic.

DR. LIVINGSTONE.

The rescue of Dr. Livingstone, through the energy, intrepidity, and capacity of Mr. Stanley, in the successful carrying-out of the expedition instituted by our fellow-member, Mr. James Gordon Bennett, for the deliverance of the great African traveller, and the extensive nature of the discoveries he has made, have been so fully published in the journals of this country and of Europe as to dispense with the necessity of my doing anything more than to unite in the common congratulation interchanged throughout the world at this happy event. The limits of a discourse embracing so wide a survey will not enable me to enter into any extended observations upon the Doctor's discoveries. I can only say that I share in the general impression that the great water-system he has been following up is not, as he supposes, connected with the Nile. This belief is founded upon Baker's measurement of the elevation of the Mwutan Nzigi, or Albert Nyanza, and Livingstone's account of the Lualaba River; the discoveries of Dr. Schweinfurth in the White Nile region; the fact that from Dr. Livingstone's account the Lualaba carries nineteen times as much water as the Bhar-al-Ghazel, the chief western tributary of the White Nile, and three times as much as the White Nile. These and other reasons advanced by Dr. Behm and Clements R. Markham, C. B., would seem to warrant the conclusion that the water-system which the Doctor has been exploring constitutes the chief source of the Congo, a river, at least as it approaches the Atlantic, of great volume, depth, and velocity. But this conclusion is disputed by Dr. Beke, a very competent authority on all African matters; and indeed it is a very hazardous thing to express any opinion upon the geography of the unexplored portions of Africa, as was found after the discovery of the curious course of the Niger. The southern part of the Mwutan Nzigi, or Albert Nyanza, has yet to be explored; and we must wait until Dr. Livingstone has completed his explorations, which will probably be accomplished in two or three years, for the solution of the problem. The last intelligence respecting the Doctor is that the supplies forwarded to him by Mr. Stanley had reached him, and that he had left Unyanyembe to complete his discoveries; also that his observations, which were brought to Zanzibar by Mr. Stanley, have arrived at the Cape, and are in the hands of Sir Thomas Maclear; that they contain some things that are new and interesting, are very voluminous, and that it will take two or three months to reduce them.

Dr. Schweinfurth's Explorations West of the White Nile.

Dr. Gustav Schweinfurth has been engaged, since 1868, in exploring Africa west of the White Nile, and has traced to its source the Bhar-al-Ghazel, the most important of the western branches of the White Nile. This gentleman, who appeared before the Berlin Geographical Society last May, has brought back a large amount of geographical information, which will go far towards settling, if it do not completely settle, the question of the sources of the Nile. He penetrated west as far as lon. 26° and south to within 3° 30′ of the equator; and, as Livingstone has penetrated to nearly an equal distance towards the equator, the space of this unknown region has been materially diminished, and will ere long be explored. Dr. Schweinfurth found that a spur from those Blue Mountains of the Balegga which were seen by Sir Samuel Baker formed the water-parting between the Nile and a river which the Doctor has discovered called the Uelle or Welle; and that the streams which have been explored either by himself, or, previously, by Petherick, rise on the northern side of this spur, or water-parting, and unite to form the Bhar-al-Ghazel. This water-parting, he says, has a uniform slope to the north and west, broken only by granite masses which rise to a height of 3,000 feet above the sea-level. This range seems to sink gradually to the west, and has, the Doctor says, a very different character from the Nile valley to the north, or the valley of the river at the south which he discovered, the Uelle. This river he found to be 800 feet wide and twenty feet deep ; along its valley was a luxuriant growth of vegetation, oil palms, sugar-cane, and tropical fruits, and he thinks that this river continues westward and northward to Lake Tschad. In the Mombuttu country he found in the vegetation and in the animals indications of the affinity of that region with the western coast; amongst which may be instanced the existence of the gorilla.

Like Livingstone, he found tribes that are cannibals, and to the south of the Mombuttu country there exists a dwarfish race, or pigmies, known by the name of the Acca, which Herr Bastian, the president of the Berlin Geographical Society, supposes to be the Baccabacca, a dwarfish race, in the east of Central Africa, mentioned by early writers. Dr. S. brought one of these pigmies back with him nearly as far as Khartoum, who died and was buried at Khartoum. The discovery of this dwarfish people is a confirmation of the pigmies mentioned by Homer, Aristotle, and Herodotus as living near the sources of the Nile. The Dokos, or pigmies of Dr. Krapf, are placed by him about the same parallel of latitude, but further to the east; whilst the Obongos, the curious little people described by Du Chaillu, dwelt in Ashango Land, on the western coast, near the equator.

The people of Niam Niam or Sandeh, that inhabit the region where these western sources of the White Nile rise, and where the River Uelle flows, are described by Dr. Schweinfurth as totally different from the Nile tribes. He found them gluttonous, skilful in pottery without the use of the wheel, in basket-making, carving, carpenter-work, and in the forging of their weapons. They exhibited, also, great taste for music, having a national instrument, which is a kind of cross between the harp and the guitar. Their burial-rites resemble those of the Arabs, and their language is a Nubian dialect, without grammatical inflections or any words to express abstract ideas. This very interesting and important journey embraced a period of three years and four months, and Dr. Schweinfurth has now gone upon another African expedition, the expense of which is to be borne by his brother, a merchant of Riga.

M. GRANDIDIER'S EXPLORATIONS IN MADAGASCAR.

M. Alfred Grandidier, a French naturalist, has been engaged for five years in exploring the Island of Madagascar. He says that hardly any of the accounts that have been published respecting Madagascar, no matter in what language they have been written, are reliable ; and that the interior of this great island upon modern maps is filled with false rivers, mountains, and places altogether imaginary. My limits will not allow me to go into the details of this most interesting exploration. Between the years 1865 and 1870 M. Grandidier fixed the latitude of 188 different points, the longitude of twenty-four towns; made a very large number of observations, barometrical, thermometrical, and astronomical, and examined the coast-line for 1,250 miles, and when to this are added ethnological investigations, the taking of a large number of photographs, and his collections in natural history, some idea may be formed of the extent and value of the labors of this indefatigable explorer.

Ancient Ruins Discovered by Karl Mauch.

Karl Mauch, the discoverer of the gold-fields in South-east Africa in 1871, and who made the perilous descent of the Vaal River alone, in a wretched flat-bottomed boat, for 350 miles, to its junction with the Orange River, has made an interesting discovery of a ruined city lying 160 miles due west from Sofala, a town on the east coast of Africa. These ruins, which are named Zimbabye (in Portuguese Zimbaoe), and which he places in lat. 20° 14′, and lon. 31° 48′, consist of two different parts, separated from each other by a distance of 300 yards; the one part being upon a granite rock 400 feet high, and the other upon a terrace of lesser elevation. The heavy growth of vegetation and heaps of rubbish prevented him from examining them as fully as could have been wished. He found ruined walls, thirty feet high and varying from ten to fifteen feet in width, formed of stones of hewn granite, put together without mortar. In several places ornamental stone pillars projected eight or ten feet beyond the mason-work, and the zigzag direction of the walls and labyrinthine passages connected with them seemed to indicate the ruins of a great fortress. He particularly examined a tower, thirty feet high, built also of blocks of granite, which was well preserved. It was cylindrical in form for the first ten feet from the base, the base being fifteen feet in diameter; and the rest of the tower was of a conical shape, being at the top eight feet in diameter. The presumption is that these ruins are of high antiquity. It is inferred, from their structure and general character, that they were not built by the Portuguese, the Arabs, or by any of the black tribes that inhabit the part of Africa in which the ruins where found. According to the account given by the inhabitants in the vicinity, they have occupied the country only for about forty years, and they say that when they came there the country was uninhabited. It was assumed, however, by all of them, that the region was once inhabited by a white race, which seems to be confirmed by traces of habitations, and by implements found, which never could have been made by the blacks. The country between the ruins and the east coast is of a most pestilential character, which will probably account for its remaining so long unknown. The country, however, where the ruins are situated is a fine one. It is a high plateau, 400 feet above the level of the sea, well watered, fertile, and thickly inhabited by a very industrious people, who are agriculturists and cattle-raisers. The existence of ruins of this nature so far inland from the coast is certainly very singular. It is conjectured that they were built by the Phœnicians; and Petermann, to whom Karl Mauch sent the account of his discovery, thinks, from their proximity to the newly discovered gold-fields, that the locality of these ruins is the Ophir so long sought for, to which Solomon sent for gold, ivory, and precious stones. The locality of the Ophir of the Bible, however, is a question that has been much discussed by archæological scholars and geographers, and there are many grave objections to be considered before entirely assenting to Dr. Petermann's conjecture. The intelligence has just been received that Karl Mauch has returned to Europe, I regret to learn, very much enfeebled by the African fever.

Suppression of the African Slave-Trade.

Whilst the slave-trade has entirely ceased on the west coast of Africa, it is maintained with great activity upon the east coast, and in the countries watered by the streams which flow from the west into the White Nile; the point of concentration or the emporium of the latter traffic being at Khartoum, on the White Nile. It has been for the suppression of the latter trade that, with the aid of the Viceroy of Egypt, the expedition of Sir Samuel Baker was undertaken, and that distinguished traveller was of the opinion, towards the end of 1870, that the traffic upon the White Nile had been entirely suppressed; but information from Khartoum, during the present year, is to the effect that this is far from being the case. Dr. Schweinfurth is of the opinion that the military expedition of Sir Samuel Baker into the countries of the Bhar-al-Ghazel, which, he says, has already cost £400,000, is, as he expresses it, "an awful mistake." He says that the best the Viceroy can do with these negro countries is to let them alone; that they are not productive, and that if they were, their distance from navigable streams is too great to admit of the exportation of anything less valuable than ivory. In his opinion, the slave-trade can be stopped in this direction only by cutting off its sources, and closing up its outlets; which he regards as a difficult and very expensive undertaking. Baker left Gondokoro in 1871, and nothing definite has since been heard from him. Fearing that he might be cut off by intervening hostile tribes, the Viceroy of Egypt has recently decided to send an expedition for his relief, the command of which is to be intrusted to Col. Purdy, an American officer. Sir Bartle Frere, at the head of an expedition for the suppression of the slave-trade upon the east coast of Africa, has arrived at Zanzibar. From the capacity of this eminent man, supported as his expedition is by the governments that have coöperated to further its objects, there is reason to hope that he will be able to destroy the means that have hitherto sustained the slave trade upon the eastern coast, through the open support of it by the Sultan of Zanzibar, and the secret encouragement given to it by the Portuguese officials. The opening of the large region of Central Africa to civilization—a country the great value of which is now becoming apparent—depends more upon the suppression of this infamous and debasing traffic than upon anything else.

THE LIVINGSTONE EAST COAST EXPEDITION.

In connection with the expedition of Sir Bartle Frere is what is known as "The Livingstone East Coast Expedition," for the prosecution of which Sir Bartle Frere has received £1,500 from the Livingstone Fund. The command of this special expedition has been intrusted to Lieut. V. L. Cameron, R. N., who will be accompanied by Dr. Dillon. What is to be undertaken is to be settled at Zanzibar, and is, probably, now determined upon. Mr. Clements R. Markham, C. B., is of the opinion that the expedition will proceed to Lake Tanganyika, and from there attempt to communicate with Dr. Livingstone, who, it is thought, may be then upon the western shore examining the underground dwellings of Kabogo; that it will supply the Doctor with the watches and instruments he needs, and then undertake any work he may suggest. It is supposed that he will desire that these officers should examine the region of Lake Ukerewe, or Victoria Nyanza, and explore the country between the southern end of the Mwutan Nzigi, or Albert Nyanza, and Lake Tanganyika.

LIVINGSTONE'S CONGO EXPEDITION.

There is also a coöperating expedition upon the west coast, called "The Livingstone Congo Expedition," commanded by Lieut. W. J. Gandy, R. N., an officer who has had experience as an African explorer, both upon the western and the eastern coast. This expedition is fitted out by the Royal Geographical Society, a fund of £2,000 having been generously contributed for that purpose by Mr. J. Young, Livingstone's old and tried friend. This expedition has gone to Sierra Leone, where the Africans who are to accompany it are to be obtained, and from thence it will proceed to St. Paul de Loando, south of the mouth of the Congo. From this place the expedition will make its way by San Salvador to the banks of the Congo, and, ascending this great river, will attempt to reach its head-waters and source, which is supposed to be one of the great lakes recently discovered by Livingstone. Lieut. Gandy, before his departure, published an admirable paper on the Congo, in Mr. Markham's *Ocean Highways*, embodying all that is known respecting this important river, accompanied by a map giving an outline of the country from the west coast to the region of Livingstone's discoveries; upon which Lieut. Gandy has indicated his conjectures as to the upper tributaries and sources of this long-known and mysterious river. The Congo, under the name of the Zaire, has been represented upon maps since the days of Ortelius as one amongst the greatest of African rivers, as an immense stream running westwardly into the Atlantic, and deriving its waters from a great chain of lakes; and yet, with the exception of the exploration of it for 280 miles by Capt. Tuckey, in 1816, we know as little about it now as was known in the sixteenth century. This is, therefore, a most important expedition; and, if successful, there is every reason to believe that it will, in connection with the recent discoveries of Livingstone, clear up what is now the greatest of African problems.

Conclusion.

In conclusion, I may say, after this survey of the labors of the year, that the spectacle it presents is one of earnest and wide-spread activity in the prosecution of geographical inquiry. This is due in no inconsiderable degree to the formation in different countries, within the last forty years, of geographical societies that have gradually impressed upon the age the importance of exploring the unknown regions of the earth, and of obtaining more accurate and scientific knowledge of the parts that are known,—as a means alike of bringing about a more extended intercourse amongst mankind, and of enlarging our knowledge of those great physical laws, as yet but imperfectly understood, which affect the earth and everything existing upon it.* This activity is due also to the establishment during the last few years of periodicals devoted either exclusively or in part to the advancement of geographical science. I would especially refer to Dr. Petermann's *Mittheilungen*, and Mr. Markham's *Ocean Highways*, periodicals distinguished for the marked ability with which they are conducted, and the extent and value of the information they supply. I should also mention the monthly *Illustrated Travels*, edited by H. W. Bates, Esq., the Assistant Secretary of the Royal Geographical Society; the weekly publication of *Nature*, conducted by Mr. J. Norman Lockyer, the eminent astronomer, which as a general scientific journal furnishes much information upon geographical subjects; the *Annuaire Géographique*, published at Paris; and *Le Globe*, a geographical journal, published at Geneva.

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* There are now throughout the world, as far as I have been able to ascertain, thirty-one (31) geographical societies. I give their names and where situated. Belgium: Belgian Geographical Society, *Antwerp.* England: Royal Geographical Society, *London.* France: Geographical Society, *Paris;* the Geographical Circle, *Lyons.* Russia: Imperial Russian Geographical Society, *St. Petersburg;* Geographical Society, *Irkootsk;* Society of Explorers of Western Siberia, *Omsk;* section of the Imperial Russian Geographical Society, *Orenburg;* Caucasian Geographical Society, *Tiflis;* section of the St. Petersburg Society, *Vilna.* Germany: Geographical Society, *Berlin;* Imperial Royal Geographical Society, *Vienna;* Geographical Association, *Dresden;* Geographical Society, *Munich;* Association of the Friends of Geography, *Leipsic;* Committee of the North-Polar Expedition, *Bremen;* Association for Geography and Kindred Sciences, *Darmstadt;* Association for Geography and Natural Sciences, *Kiel;* Geographical Institute, *Gotha.* Hungary: Association for the Exploration of Transylvania, *Hermannstadt;* Geographical Society, *Pesth.* Holland: Royal Institute for the Philology, Geography, and Ethnography of Dutch India, *The Hague.* Italy: Italian Geographical Society, *Florence;* Italian Geographical Circle, *Turin.* Spain: Royal Spanish Academy of Archæology and Geography, *Madrid.* India: Geographical Society, *Bombay.* United States: American Geographical Society, *New York.* Mexico: Mexican Geographical and Statistical Society, *Mexico.* South America: Imperial Geographical Society, *Rio Janeiro;* Historical Geographical and Ethnographical Institute of the Empire of Brazil, *Rio Janeiro;* Historical and Geographical Institute of the Rio de la Plata, *Buenos Ayres.*

The stimulus given by the geographical societies, and by these periodicals, is very essential; for no branch of knowledge has been so slow in its development, or has had so many obstacles to evercome, as geography. The world has had to unlearn a great deal believed in for centuries upon the tales of travellers, and the imaginary knowledge of cosmographers. It took a long period of time to convince men of what was opposed to the evidence of their senses,—that the earth, instead of being flat, was round; that, instead of being stationary, it was constantly in motion; and that, instead of the sun's moving around it, it moves around the sun. The spherical form of the earth, its diurnal motion upon its axis, and its annual revolution around the sun, were known to Eudoxus 300 B. C.; and 450 years afterwards, in the second century of our era, Ptolemy, in his principal work, brought together a body of reasons, many of which are incomprehensible to us, upon which he came to the conclusion that the alleged diurnal and annual movement of the earth were untrue, and the world accepted his decision for 1,300 years. Within twenty years after Galileo demonstrated the diurnal motion of the earth, Bernard Varen, or, as he is called, Varenius, the physician of Amsterdam, published the celebrated work which revolutionized the science of geography, and laid the foundation of a separate science, that of physical geography; and yet it is only within the last half century that physical geography has assumed the character of a distinct branch of inquiry. Even at the present period the progress of geography is slow, for if we use the term "knowledge" as expressing what the science of geography demands, the world is not more than half known; and though there are not now, as in the days of Prince Henry the Navigator and of Columbus, great continents or vast islands to discover, let it not be forgotten that a considerable portion of the earth is yet unexplored; that a very large part is known but imperfectly, and that physical geography presents an immense field for the future labors of mankind.